

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR FOR LOW-RISK NULLIPAROUS WOMEN

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Highlights: (1) Some interventions, such as the use of partograms and non-pharmacological methods of pain relief, may reduce labor time in nulliparous women. (2) The use of oxytocin and the Kristeller maneuver are associated with an increased likelihood of postpartum complications. (3) It is essential to personalize interventions during labor to meet the individual needs of patients, promoting humane and safe care.

PRE-PROOF

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MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

ABSTRACT

This study aimed to analyze maternal outcomes associated with interventions performed during low-risk nulliparous women labor. This is a cross-sectional study, with 534 nulliparous pregnant women. Gamma and logistic regression models were used for the $p < 0.05$ significance level. The use of partogram, venoclysis, non-pharmacological methods for pain relief, neuraxial analgesia and Valsalva maneuver are associated with a reduction in the expulsive period duration. Cardiography on admission (OR=0.20), oxytocin (OR=0.22) and fasting (OR=0.15) during labor decreased the chances of vaginal delivery, whereas partogram (OR=11.00) and non-pharmacological pain relief methods increased the chances (OR=2.12).. The study revealed no association between the interventions and the degree of perineal laceration. The use of oxytocin (OR=3.04) and the Kristeller maneuver (OR=9.03) were shown to increase the chances of complications after childbirth, with a prevalence of postpartum hemorrhage. It is concluded that interventions during labor of nulliparous women must be individualized and minimized, in order to be implemented to obtain favorable outcomes for parturients and their fetuses.

Keywords: Maternal Health; Obstetrics; Obstetric Nursing; Labor of Childbirth; Childbirth Assistance; Humanized birth.

INTRODUCTION

Birth in a hospital environment is characterized by the adoption of various technologies with the aim of making it safer for the woman and her child. Thus, advances in obstetrics have contributed to improving maternal and perinatal morbidity and mortality indicators. However, the current care model considers pregnancy, labor, and birth to be pathological events, exposing women and newborns to high interventions rates, which should only be used in situations of need and not as a routine¹.

With the emergence of new scientific evidence, obstetric practice has undergone significant changes, with greater emphasis on promoting and rescuing the natural and physiological characteristics of labor and birth². As a result, various hospital procedures have been questioned due to the lack of evidence to support or counteract them. The ideal approach

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR FOR LOW-RISK NULLIPAROUS WOMEN

to be adopted during labor and delivery should be based on a balance between the probability of a vaginal birth, which should be maximized, and the maternal and perinatal risks, which should be minimized². However, there is still no consensus on the management of labor assistance, starting with its definition and the time limits established for its duration, and more scientific evidence is needed².

Many obstetric interventions are of limited or uncertain benefit to low-risk women in spontaneous labor, and many of these can be minimized by involving these women in decision-making. Therefore, obstetric care providers must be familiar with and willing to consider the use of low-intervention approaches, and there must be a valid reason for intervening in a natural process, with uncomplicated evolution and outcome for the woman and her child³.

In 2018, the World Health Organization (WHO) published new guidelines to establish global standards of care for healthy pregnant women and thereby reduce unnecessary medical interventions, in which it recommends that medical and nursing teams do not interfere in a woman's labor in order to speed it up, unless there are real risks of complications for the parturient and/or the unborn child⁴.

Given that nulliparous parturients have relatively longer labor times, they are therefore more vulnerable to interventions, as it is usually a longer process⁵. In addition, the scarcity of high-quality evidence and divergent protocols established on labor care makes the decision on how to proceed dependent on the theoretical and practical knowledge of the professional assisting them, which can lead to an unfavorable outcome for the mother-child binomial.

The interest in studying the aspects related to this process emerged: What interventions occur during the labor and delivery of low-risk nulliparous women, how often do they occur and how is the outcome of delivery in relation to maternal conditions? In view of the above, the study aimed to analyze maternal outcomes associated with interventions carried out during the labor of low-risk nulliparous women.

METHOD

This cross-sectional study, guided by the STROBE tool, was carried out in a tertiary-level Maternity School in Fortaleza, CE, Brazil, linked to the Unified Health System and

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

recognized as a support center for good practices in obstetrics and neonatology by the Stork Network. Data was collected from February to August 2018.

The study population consisted of all nulliparous parturients admitted to the obstetric center (OC) of this institution. During the data collection period, a total of 713 admissions of nulliparous parturients to the OC were observed. The sample consisted of all low-risk nulliparous parturients who met the inclusion and exclusion criteria, totaling 534 participants.

The following inclusion criteria were used to compose the sample: low-risk nulliparous women, single gestation, at term, vertex cephalic presentation, spontaneous labor, healthy women and fetuses, without comorbidities. Exclusion criteria: nulliparous women who were admitted to the institution during the expulsion period, with dilation equal to 10 cm and parturients who came to be considered at high obstetric risk during the labor evolution, for example, those who had a pressure spike during labor.

The sample was defined in a non-probabilistic, consecutive way, according to the demand for low-risk nulliparous parturients admitted to the obstetric center of the maternity hospital under study during the data collection period.

The predictor variables used to assess childbirth were: interventions carried out during labor and delivery such as: cardiotocography (CTG) on admission, presence of a companion, oxytocin and partogram use, venoclysis, fasting, amniotomy, use of non-pharmacological methods for pain relief during childbirth (NPM), neuroaxial analgesia, valsalva maneuver, episiotomy, Kristeller maneuver, vertical or non-vertical delivery position. The duration of the expulsive period, vaginal delivery, degree of perineal laceration and birth complications were assessed as outcomes.

A form designed by the researcher with closed questions was used and applied through direct observation of the care provided to the parturient woman, as well as the search for socio-economic and obstetric data in the medical records and the monitoring/evaluation forms of the delivery and birth care provided by the Stork Network.

The data was organized using the Redcap program and processed in R Studio version 4.00. They were analyzed using descriptive and analytical statistics, gamma regression models were applied for the variable duration of expulsion, logistic regression models were applied for the other outcome variables and the odds ratios of the logistic regressions were calculated, with data with a p-value <0.05 being considered statistically significant.

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

The study complied with National Health Council Resolution 466/12 and was authorized by the CEP under opinion number 2.510.987.

RESULTS

The sample consisted of 534 low-risk nulliparous deliveries between the ages of 13 and 39. Of these, 373 (69.8%) were between 20 and 35 years old, with a mean of 22.06 years \pm 5.45. In relation to marital status, 275 (51.5%) had a partner. A total of 339 (63.5%) were self-declared brown, 491 (91.9%) came from the capital and Fortaleza's metropolitan region, 307 (57.5%) reported having between 6 and 10 years of schooling, corresponding to elementary school II. As for socio-economic variables, 322 (60.3%) of the participants had no income and 200 (37.5%) earned between one and two minimum wages. In relation to occupation, 233 (43.6%) worked in the home and 132 (24.7%) were students. The majority did unpaid work.

The distribution of data related to the obstetric history of the parturients showed that 480 (89.9%) were primiparous and that 54 (10.1%) of them had had at least one abortion. The majority, 349 (65.4%) women, were between 39s1d and 41s4d, with a mean of 7 prenatal consultations 419 (78.5%) and a predominance of uneventful pregnancies 420 (78.7%).

Table 1 – Results of the Gamma regression model for the outcome variable duration of the expulsive period according to the interventions performed during labor.

| Labor Interventions | β | CI 95% | Standard Deviation | <i>p</i> -value |
|---------------------------|---------|-------------------|-----------------------|-----------------|
| Intercept | 127.99 | 109.61 – 150.54 | 10.30 | 0.00 |
| Partogram | -26.37 | -38.60 – (-11.42) | 6.81 | 0.00 |
| Venoclysis | -15.29 | -25.23 – (-5.80) | 5.00 | 0.00 |
| NPM Use | -14.80 | -25.02 – (-3.83) | 5.41 | 0.01 |
| Pharmacological analgesia | -24.95 | -47.83 – (-5.99) | 10.60 | 0.02 |
| Valsalva maneuver | -12.25 | -22.33 – (-2.64) | 5.02 | 0.02 |

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

The Gamma regression model showed that the interventions partogram, venoclysis, use of non-pharmacological methods of pain relief (NPM), neuroaxial analgesia and valsalva maneuver, carried out during labor, influenced the reduction in the length of the expulsive period, with a mean duration of 86 minutes.

The variables that showed a significant association with the outcome delivery type were CTG on admission, use of oxytocin, partogram, fasting and NPM, with a p-value lower than the significance level adopted, 0.05 (Table 2).

It was found that having undergone CTG on admission reduced the chances of vaginal delivery by five times compared to those who did not have CTG on admission. Parturients who received intravenous oxytocin infusion during labor were 4.54 times less likely to have a vaginal birth compared to those who did not. Those who had graphic monitoring of labor using the partogram had an eleven-fold increase in the likelihood of vaginal delivery compared to those who did not have a partogram.

Parturients who fasted decreased their chances of having a normal birth by 6.66 times compared to those who ate during labor. Parturients who were given a non-pharmacological method of pain relief during labor were 2.12 times more likely to have a vaginal birth than those who were not.

Table 2 – Results of the logistic regression model for the dependent variable Type of Birth according to the interventions carried out during labor.

| Labor Interventions | β | OC | IC 95% | Standard Deviation | <i>p</i> -value |
|---------------------|---------|-------|--------------|-----------------------|-----------------|
| Intercept | 0.35 | - | - | 0.73 | 0.63 |
| CTG on admission | -1.61 | 0.20 | 0.05 – 0.62 | 0.65 | 0.01 |
| Oxytocin use | -1.53 | 0.22 | 0.13 – 0.37 | 0.28 | 0.00 |
| Partogram | 2.40 | 11.00 | 5.36 – 23.61 | 0.38 | 0.00 |
| Fasting | -1.88 | 0.15 | 0.06 – 0.36 | 0.44 | 0.00 |
| NPM use | 0.75 | 2.12 | 1.16 – 3.80 | 0.30 | 0.01 |

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

As for the outcome degree of perineal laceration, there was no association between the interventions performed during labor (Table 3).

Table 3 – Results of the logistic regression model for the dependent variable Degree of perineal laceration according to the interventions performed during labor.

| Labor Interventions | Estimate | Standard deviation | <i>p</i> -value |
|----------------------------------|----------|--------------------|-----------------|
| Intercept | 143.50 | 0.00 | 1.00 |
| CTG on admission | -19.29 | 0.00 | 1.00 |
| Companion | -40.14 | -0.01 | 1.00 |
| Oxytocin use | -1215.00 | -0.95 | 0.34 |
| Partogram | -58.81 | -0.01 | 1.00 |
| Venoclysis | -19.75 | 0.00 | 1.00 |
| Fasting | 0.24 | 0.29 | 0.77 |
| Amniotomia | 0.00 | 0.00 | 1.00 |
| NPM use | -25.28 | 0.00 | 1.00 |
| Pharmacological analgesia | -0.05 | 0.00 | 1.00 |
| Valsalva maneuver | 1.05 | 1.25 | 0.21 |
| Episiotomy | 18.52 | 0.00 | 1.00 |
| Kristeller maneuver | 18.03 | 0.00 | 1.00 |
| Position in the expulsion period | -18.33 | 0.00 | 1.00 |

The variables use of oxytocin, use of non-pharmacological pain relief methods (NPM) and the Kristeller maneuver were significant and showed an association when compared to the outcome birth complications, with a significance level of 0.05 (Table 4).

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

Parturients who received intravenous oxytocin infusion during labor were three times more likely to have birth complications than those who did not. Patients who underwent the Kristeller maneuver during the expulsive period had a nine-fold increase in their chances of having labor complications compared to those who did not receive the maneuver.

Table 4 – Results of the logistic regression model for the dependent variable Birth Complications according to the interventions performed during labor.

| Labor Interventions | β | OC | CI 95% | Standard Deviation | <i>p</i> -value |
|----------------------|---------|------|--------------|--------------------|-----------------|
| Intercept | -3.46 | - | - | 0.66 | 0.00 |
| Oxytocin use | 1.11 | 3.04 | 1.08 – 8.87 | 0.53 | 0.04 |
| Venoclysis | -0.88 | 0.41 | 0.15 – 1.01 | 0.47 | 0.06 |
| Amniotomy | -0.55 | 0.58 | 0.26 – 1.22 | 0.39 | 0.16 |
| NPM use | -0.52 | 0.46 | 0.17 – 1.07 | 0.34 | 0.12 |
| Neuroaxial analgesia | -1.10 | 0.33 | 0.04 – 1.29 | 0.80 | 0.17 |
| Kristeller maneuver | 2.20 | 9.03 | 1.66 – 43.40 | 0.80 | 0.01 |

Birth complications were analyzed, and it was observed that postpartum hemorrhage was prevalent, with more than 70% of cases (Table 5).

Table 5 – Birth complications in nulliparous women after interventions during labor.

| Birth complications | n | % |
|-----------------------------|----|-------|
| Placental retention | 05 | 14.70 |
| Postpartum hemorrhage (PPH) | 24 | 70.50 |
| Severe perineal laceration | 05 | 14.70 |
| TOTAL | 34 | 100 |

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

DISCUSSION

The results show aspects related to the duration of the expulsive period in nulliparous women, where the interventions partogram, venoclysis, use of non-pharmacological methods for pain relief, neuroaxial analgesia and valsalva maneuver influenced the reduction in expulsive time and, although this time varied with considerable heterogeneity, women in labor should be encouraged to choose methods that help them to be comfortable and shorten the duration of labor.

Traditionally, the progress of labor is measured by cervical dilation. However, the expected progression varies between the guidelines adopted by each institution and there is therefore no standardized definition of the duration and onset of labor, nor is there a consensus on which guideline is most suitable for clinical use⁶.

The mean duration of the expulsive period was 86 minutes, similar to the secondary analysis of a cluster randomized controlled study involving fourteen Norwegian maternity hospitals, comparing two groups, where the adjusted difference between them was 0.18h (95% CI, 0.1-0.3), which was significant in both groups. This reinforces the point that time is still an uncertain variable for defining progression and dystocia in labor, mainly due to the lack of consensus on the actual waiting time for labor to progress⁷.

A prospective cohort study of 204 nulliparous women with prolonged second-stage labor showed that measuring the change in head-perineum distance using transperineal ultrasound during active pulls provides an objective assessment of fetal head descent and that a greater degree of head descent during active/spontaneous pulls was associated with shorter duration of labor⁸.

In relation to NPM use for pain relief in childbirth, a randomized controlled clinical trial with 128 parturients allocated to three groups of therapies, bath, ball, isolated and combined, showed an increase in pain scores, dilation and contractions and a reduction in anxiety in all groups and concluded that the therapies studied contribute to maternal adaptation and well-being and favor the evolution of labor⁹.

In relation to the outcome of vaginal delivery, it was observed that cardiotocography on admission reduced the chances of vaginal delivery. Results of a similar study showed that admission CTG is a simple, easy, inexpensive, and non-invasive screening method, useful in detecting fetal distress already present at the admission time and can play a crucial role in

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

predicting fetal well-being during labor. It also helps in planning early intervention to prevent adverse perinatal outcomes, especially in hospitals with limited resources and high patient loads¹⁰.

Corroborating these findings, a randomized, multicentre study of 3034 women carried out in three maternity hospitals in Ireland concluded that there were no differences in obstetric or neonatal outcomes between intermittent auscultation and CTG on admission for women with possible onset of labor but pointed to an increased risk of continuous CTG in women who received CTG on admission¹¹.

As for whether the oxytocin use contributed to a reduction in the chances of vaginal delivery, similar data was found in a sample extracted from a study of 27077 low-risk nulliparous women admitted to hospitals for spontaneous labor onset and concluded that the adoption of standardized, evidence-based approaches to diagnose active labor onset, assess labor progress and diagnose dystocia can safely decrease the rates of oxytocin increase and caesarean section in the United States¹².

The use of the partogram was associated with an increased chance of vaginal delivery. This finding is relevant, given that the literature presents divergences regarding the clinical effects of the traditional partogram¹³. Furthermore, the new WHO partograph model has the potential to promote woman-centred care, continuous assessment and decision-making throughout labor, where its implementation must be accompanied by the necessary initial and ongoing training and strategies to promote an environment conducive to professionals using it efficiently¹⁴. In addition, the Partogram use is considered a good childbirth care practice, a tool that helps to monitor labor in order to promote adequate care¹⁵.

In relation to food intake during labor, it was observed that fasting during labor contributed to a reduction in the chances of vaginal delivery. These findings are in line with a study showing that oral restriction of liquids or food during labor is not recommended¹⁶.

In line with these findings, a retrospective cross-sectional study of 2797 women admitted in labor to a suburban community hospital in the northeastern United States concluded that allowing free oral intake during labor does not increase adverse maternal or neonatal outcomes and increases patient satisfaction¹⁷.

As for complications after childbirth, the results show that the administration of intravenous oxytocin during labor increased the chances of complications after vaginal delivery. A similar finding shows that the administration of oxytocin during labor for low-risk

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

women can lead to worse birth outcomes, with an increased risk of instrumental delivery and caesarean section, episiotomy, and the use of epidural analgesia for pain relief¹⁸.

In addition, in a retrospective study that reviewed the medical records of parturients who underwent caesarean section and who used oxytocin during labor, as well as the dose used and the duration of administration, it was concluded that patients who used oxytocin required a high rate of infusion of the drug after caesarean section more often than parturients who did not receive oxytocin, in addition to needing to receive other uterotonics more commonly¹⁹.

In relation to the Kristeller maneuver, there is evidence of widespread and continuous use of manual pressure on the uterine fundus during labor in health facilities internationally. This procedure currently has no evidence of benefit and has the potential to cause harm to women and their babies. Efforts to prevent this unnecessary practice should be implemented through the development of relevant and evidence-based policies, training of health professionals, use of audit and quality improvement initiatives²⁰.

It was observed that postpartum hemorrhage was the most frequent complication among the participants. In a cohort of 24,729 women who gave birth vaginally, which aimed to identify phenotypes of labor processes, such as duration, intervention type and estimate the probability of PPH, it was concluded that nulliparous women had a higher odds ratio for PPH²¹. Nulliparous women tend to have relatively longer labor durations and are more vulnerable to genital tract trauma than multiparous women^{5,22}, which may explain part of the risk associated with PPH.

In addition, women with prolonged labor (duration > 12 h) are at risk of a negative birth experience. Prolonged labor alone does not predict the desire for a caesarean section in a subsequent pregnancy. However, women with long labor more often experienced operative deliveries, which becomes a risk factor for a later desire for a caesarean section²³.

This study shows that understanding the association between interventions carried out during the labor of nulliparous women and postpartum outcomes in this population is of great importance for clinical practice, offering useful information about the implications generated by these interventions during the progression of labor, as well as revealing the great individual variations in the patterns of evolution of the parturition process, illustrating the importance of assessing the progression of labor individually.

MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR FOR LOW-RISK NULLIPAROUS WOMEN

One of the limitations of the study was the failure to include variables that could have influenced the results obtained, such as the clinical experience of the professional who carried out the interventions during labor. It is also impossible to infer causality from the data in this study.

CONCLUSION

The interventions partogram, venoclysis, use of non-pharmacological pain relief methods, neuroaxial analgesia and valsalva maneuver were associated with a reduction in the expulsive period length. Cardiotography on admission, oxytocin and fasting decreased the chances of vaginal delivery, whereas partogram and non-pharmacological pain relief methods increased the chances. The use of oxytocin and the Kristeller maneuver were shown to increase the chances of complications after delivery.

This study provides theoretical foundations to help establish obstetric practices in line with humanized and safe care. Interventions during the labor of nulliparous women should be individualized and minimized, so that they can be implemented to obtain favorable outcomes for parturients and their unborn children, based on scientific evidence, as well as the search for maternal satisfaction.

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MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

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MATERNAL OUTCOMES ASSOCIATED WITH INTERVENTIONS IN LABOR
FOR LOW-RISK NULLIPAROUS WOMEN

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